NEW YORK GATEWAY CONNECTIONS IMPROVEMENT PROJECT TO THE US PEACE BRIDGE PLAZA

Draft Design Report/Environmental Impact Statement

Draft Section 4(f) Evaluation (49 USC 303)

APPENDIX E – WATER QUALITY REPORT

PIN 5760.80
City of Buffalo
Erie County, New York

November 15, 2013





Appendix E

Water Quality

November 2013

Prepared for:

Prepared by:

ECOLOGY AND ENVIRONMENT, INC.

368 Pleasant View Drive Lancaster, New York 14086

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ist of Abbreviations and Acronyms

BSA Buffalo Sewer Authority

CFR Code of Federal Regulations

CWA Clean Water Act

DEIS Draft Environmental Impact Statement

E & E Ecology and Environment, Inc.

EPA U.S. Environmental Protection Agency

EPC Environmental Performance Commitments

FEIS Final Environmental Impact Statement

FHWA Federal Highway Administration

NEPA National Environmental Policy Act

NYSDOT New York State Department of Transportation

NPDES National Pollutant Discharge Elimination System

NURP Nationwide Urban Runoff Program

NYCRR New York Codes, Rules, and Regulations

NYSDEC New York State Department of Environmental Conservation

NYSTA New York State Thruway Authority
PAHs polycyclic aromatic hydrocarbons

SEQRA New York State Environmental Quality Review Act

SPDES State Pollutant Discharge Elimination System

SWPPP Storm Water Pollution Prevention Plan

WQv Water Quality Treatment volume

TMDL Total Maximum Daily Load

USACE U.S. Army Corps of Engineers

USDOT U.S. Department of Transportation

WWTP Wastewater Treatment Plant

Introduction

The Federal Highway Administration (FHWA), in cooperation with the New York State Department of Transportation (NYSDOT), has prepared this Draft Environmental Impact Statement (DEIS) in accordance with the National Environmental Policy Act (NEPA) for the New York Gateway Connections Improvement Project to the U.S. Peace Bridge Plaza (Project). The Project is located in the city of Buffalo, Erie County, New York. The Project was developed to address concerns centered on the use of local streets by cross-border traffic as it enters/exits the existing U.S. Border Port of Entry/Peace Bridge Plaza (Plaza). For this Project, the FHWA and NYSDOT are the NEPA joint lead agencies, and NYSDOT is the New York State Environmental Quality Review Act (SEQRA) lead agency.

The DEIS was prepared in accordance with the NYSDOT Project Development Manual, 17 NYCRR (New York Codes, Rules and Regulations) Part 15, and 23 CFR (Code of Federal Regulations) 771. The need, purpose, and objectives of the Project and the alternatives being considered are briefly described below. More detailed discussions concerning the Project, the environmental considerations, and options considered are provided in Chapters 1, 2, 3, 4, and 6 of the DEIS.

This appendix presents information on surface water and groundwater in the vicinity of the Project. This Appendix identifies potential sources of surface water and groundwater pollution, erosion, sedimentation, and storm water runoff impacts that may result from construction, use, and maintenance of the Project.

1.1 Where is the Project Located?

The Project is located in the West Side neighborhood of the city of Buffalo, Erie County, New York. The Project area is adjacent to Front Park, which was designed by Frederick Law Olmsted as part of a citywide park and parkway system that opened in 1868; the Project also includes a small portion of the park (the existing Baird Drive). Major roadways in the Project area include the Niagara Thruway (Interstate 190, or I-190), Porter Avenue, Baird Drive, Busti Avenue, and the I-190 ramp connections to and from the Plaza.

1.2 Need, Purpose, and Objectives

The primary need for the Project is to address the limited direct access between the Plaza and I-190. Existing direct access is limited and requires regional and international traffic to use the local street system. This limited direct access increases commercial traffic on the local streets, which were originally designed to



only meet the needs of local traffic. An additional need was identified to address the structurally deficient Porter Avenue Bridge over I-190.

The purpose of this Project is to reduce the use of the local streets by interstate traffic (autos and trucks) and provide access to and from the existing Plaza at its current location.

The following objectives have been established to support the Project's purpose and need.

- Provide direct access from the Plaza to northbound I-190,
- Redirect through traffic from Front Park,
- Remove Baird Drive, and
- Replace the Porter Avenue Bridge over I-190 and CSX Railroad.

1.3 What Alternative(s) Are Being Considered?

Based on the Project's need, purpose, and objectives, the following paragraphs briefly describe the alternatives that have been developed for study within this DEIS.

- No-Build Alternative. The No-Build Alternative assumes no improvements in the Project area other than those planned by others or implemented as part of routine maintenance. Although the No-Build Alternative does not meet the Project's purpose and need, NEPA requires that it be evaluated in the EIS. The No-Build Alternative also serves as the baseline condition against which the potential benefits and effects of the Build Alternative are evaluated.
- Build Alternative. The Build Alternative would construct a new ramp (Ramp D), providing direct access from the Plaza to northbound I-190. It would also construct a new ramp (Ramp PN) from Porter Avenue to the existing I-190 northbound exit-ramp (Ramp N/Ramp A) to the Plaza. The combination of these new ramps would allow the removal of Baird Drive from Front Park and conversion of the existing 1.8 acres of roadbed and sidewalk into additional green space. The removal of Baird Drive would permit 4.5 acres of green space located between Busti Avenue and Baird Drive to be reconnected to the greater park area. This alternative would require modifications to the Massachusetts Pumping Station access road, the Shoreline Trail bicycle/pedestrian facility along the waterfront, and four existing exit/entry ramps in the vicinity of the Plaza, as well as new signing in the vicinity of and within the Plaza to better direct vehicles to the appropriate ramps and routes.

Porter Avenue would be modified to include a roundabout or signalized intersection at 4th Street and the existing Ramp P and the proposed Ramp PN. Modifications along Porter Avenue would also include removal and replacement of the bridge over I-190 to optimize the traffic flow to the Plaza from I-190 northbound and allow for the construction of a new shared-use path along





Porter Avenue to connect Front Park to LaSalle Park and the Niagara River waterfront.

The Shoreline Trail (Riverwalk) crossing over the CSX railroad would be relocated along a new alignment north of its existing location to accommodate construction of the new Ramp D. A new structure would be constructed over I-190 and the CSX railroad, and the realigned Shoreline Trail would then turn south along the Black Rock Canal. The new trail segment would extend directly along the waterfront before connecting to the existing Shoreline Trail south of its existing underpass beneath I-190.

Water Resources

2.1 Surface Water

Due to intensive urban development, major surface water resources in the immediate vicinity of the Project area are limited to the Niagara River and the Black Rock Canal. Additional perennial and intermittent surface water drainages are located on the west side of Buffalo, but none would be impacted by this Project.

2.2 Wetlands

There are no mapped wetlands within 1.5 miles of the Project Area.

2.3 Groundwater

Groundwater in the immediate vicinity of the Project, although near the surface, is not used as a potable water source. The Project area is not located over a sole-source aquifer, as designated by the U.S. Environmental Protection Agency (EPA), or a state-designated primary or principal aquifer. Groundwater elevations within the Project area are approximately 7.5 to 37 feet below ground surface, and the water table fluctuates seasonally. The impervious nature of the existing ramps and planned changes to the ramps leading to and from the Plaza and associated surface water collection and conveyance systems prevent surface contamination from reaching the groundwater. Therefore, groundwater quality would not be impacted by this Project.

Pollutants

Pollutants from vehicles, maintenance, and deposition of air emissions accumulate on the road surfaces. These pollutants are primarily moved from the road surfaces to surface waters by rainfall runoff and the melting of snow and ice. Although these contaminants have the potential to adversely impact the quality of surface water in the vicinity of the Project, these impacts are minimized by the design of the closed storm water collection and conveyance systems. These collection systems incorporate a combination of grit, sediment, and oil separator devices to control the initial runoff, or WQv, thus preventing the potentially most polluted runoff from discharging directly into nearby surface waters. State Pollutant Discharge Elimination System (SPDES) general permits (GP-0-10-001, etc.) require the completion and implementation of a Storm Water Pollution Prevention Plan (SWPPP). As part of the SWPPP, the project design shall be develop and implement storm water management practices, including water quality treatment volume (WQv).

Most of the storm water flows over the Project area roadways via sheet flow and is collected in closed surface drainage collection and conveyance system prior to being discharged. The storm water collection and conveyance system carries the WQv and low flows to the Buffalo Sewer Authority (BSA) Bird Island Wastewater Treatment Plant (WWTP), where it is processed and then discharged to the Black Rock Canal. Heavy flows that exceed the capacity of the first-flush system are discharged directly to the Black Rock Canal.

3.1 Use of De-Icing Chemicals

Sodium chloride and calcium chloride salts (de-icers) and sand are used on local roadways and highways to maintain safe travel conditions during winter months. These de-icing materials are collected in the existing storm water system on city streets and along I-190. The flush of storm water collected in the storm water system from local city streets is collected and conveyed to either to the Bird Island WWTP for treatment or discharge directly into the Black Rock Canal. Storm water runoff treated at the Bird Island WWTP does not impact local surface water. The limited amount of storm water discharged directly to the Black Rock Canal has a minimal potential to impact local surface water. A Toler Method Analysis was conducted to determine whether any impact on surface water would result.



3.2 Metals Pollutants

Copper, lead, and zinc are the most dominant toxic pollutants contributed by highway storm water runoff. These pollutants are contaminants within materials deposited on the roadway as a result of tire and brake wear, vehicle exhaust, and mud and dirt that falls from vehicles. These pollutants are carried into adjacent surface water bodies by storm water runoff and wind. Currently, the existing storm water collection and conveyance system contains much of the storm water runoff and conveys it to the Bird Island WWTP, where it is processed before being discharged to the Black Rock Canal. Flows that exceed the capacity of the first-flush system or are collected from those portions of the storm water collection system that are not connected to Bird Island are discharged directly into the Black Rock Canal.

Erosion and Sedimentation

Erosion and sedimentation impacts associated with transportation infrastructure are caused primarily during construction, when soils are stripped of their impervious cover and vegetation. The use and maintenance of transportation infrastructure also contributes to sedimentation: materials used to sand road surfaces; materials from tire, brake, and pavement wear; particulates from vehicle exhaust; and mud and dirt that has fallen from vehicles are transported by runoff. These pollutants are prevented from entering adjacent water bodies by the collection and conveyance system mentioned above.

Any impacts resulting from erosion and sedimentation during construction would be temporary, minor, and limited to the period of construction activities. A site-specific SWPPP is required and would be prepared during final design.

Impact Analysis

To estimate the impacts the Project may have on surface water quality, the current conditions and the modeled conditions under the Build Alternative were compared.

5.1 Use of De-Icing Chemicals

The current storm water collection, conveyance, and discharge system would be maintained under the No Build Alternative, and no additional impact on surface water quality would result.

The Build Alternative would result in a reduction in the overall amount of impermeable surface area within the Project area, with the newly permeable surface area being returned to green space within the confines of Front Park (see Attachment 1). Using the Toler Method (NYSDOT 1995), the estimated impact under the Build Alternative would not change and would be less than 0.02% of the normal chloride concentration of the Niagara River/Black Rock Canal. Thus, the Build Alternative would have no impact on surface water quality.

5.2 Metals Pollutants

The use and maintenance of the roadways and access ramps leading to and from the Plaza can contribute to the possible degradation of the quality of water resources adjacent to the Project area. Materials used to clear road surfaces; materials worn from tires, brakes, and pavement; particulates from vehicle exhaust; and mud and dirt that falls from vehicles can be transported by surface water runoff and wind into the adjacent surface water bodies. The existing surface water runoff collection and conveyance system prevents impacts on surface waters in the vicinity of the Project by insuring that much of the storm water runoff is treated before being discharged to nearby surface waters.

The concentrations of copper, lead, and zinc in the waters of the Niagara River/Black Rock Canal that would result from the Build Alternative were estimated using *Pollutant Loadings and Impacts from Highway Storm Water Runoff* (USDOT 1990) (see Attachment 2).

The concentrations of copper, lead, and zinc were examined because these metals have been shown to be the most dominant toxic pollutants contributed by highway storm water runoff (USDOT 1990). The following assumptions and conditions were applied in order to complete this analysis:



- Pollution sources include the impervious surface within the Project Area. This number was generated using the same values used as in the deicing analysis.
- Rainfall, stream flow, and hardness data were taken from USDOT 1990.
- Urban traffic conditions were assumed to be greater than 30,000 vehicles per day.

The method used in USDOT 1990 assumes that an impact may occur if the ratio of the predicted once-in-three-year stream concentration of a metal to its U.S. Environmental Protection Agency (EPA) acute criterion is 1.0 or greater. The acute criteria were developed by the EPA to protect freshwater aquatic life. The acute criteria concentrations increase with total water hardness (measured as milligrams per liter (mg/L) of calcium carbonate (CaCO₃) of the receiving water. The water hardness in the area studied is expected to range from 120 to 180 mg/L CaCO₃; therefore, an assumed average water hardness of 150 mg/L CaCO₃ was used. The once-in-three-year stream pollutant concentrations were compared with the corresponding acute criteria for each heavy metal. The acute criteria for copper, lead, and zinc are presented in Table 5-1.

Table 5-1 Summary of Once-in-Three-Year Stream Pollutant Concentrations (mg/L)

		Copper		Lead		Zinc	
		EPA NURP Criteria		EPA NURP Criteria		EPA NURP Criteria	
		Acute:	0.026	Acute:	0.137	Acute:	0.450
		Threshold:	0.060	Threshold:	0.600	Threshold:	0.945
		0	nce-in-Three	e-Year Stream Pollutant		Concentration	
Alternative	Watershed	Existing	Proposed	Existing	Proposed	Existing	Proposed
No Build	Existing	0.0001	N/A	0.0004	N/A	0.0013	N/A
Preferred	U.S. side	N/A	0.0001	N/A	0.0006	N/A	0.0020

Criteria Source: FHWA-RD-88-006, April 1990, Table 4.

Water hardness = 150 mg/L CaCO_3 .

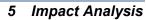
Key:

N/A = Not Applicable

NURP = Nationwide Urban Runoff Program.

The acute criteria were conservatively developed using 96-hour test exposures of the pollutants to the most sensitive aquatic species but are specified as a maximum 1-hour average with a 3-year return period. The criteria are based on a continuous exposure concept, although actual exposures of aquatic life to contaminants in storm water runoff are intermittent and short in duration. Therefore, the EPA's Nationwide Urban Runoff Program (NURP) developed estimates of approximate concentrations that would cause adverse impacts for short-duration, intermittent exposures. These concentrations are referred to as threshold effect levels (USDOT 1990).

This analysis confirmed that the current concentrations of copper, lead, and zinc from the existing roadways and ramps are well within acceptable levels and have little to no impact on the environment. Predicted future concentrations of copper, lead, and zinc for the No Build Alternative and the Build Alternative would re-





main well within acceptable levels and, thus, would have no impact on the aquatic environment.

Mitigation

6.1 Surface Water

Mitigation of potential impacts on surface water involves the installation and maintenance of an adequately sized and designed storm water collection and conveyance system to restrict the potential for surface runoff from the new ramps and additional impervious roadway along Porter Avenue to enter area waterways. The storm water collection and conveyance system would effectively eliminate the potential for most pollutants to be discharged directly into either the Black Rock Canal or the Niagara River.

6.2 Groundwater

No mitigation is required as this Project would not impact groundwater.

6.3 Erosion and Sediment Control

The Build Alternative would require the removal of approximately 1.8 acres of impervious pavement and a limited amount of grass area between Baird Drive and the adjacent sidewalk. Removal of the pavement and construction of the new entrance into Front Park will result in these areas being exposed to wind and water for a limited period of time. A site-specific SWPPP would be implemented to minimize erosion and protect the quality and quantity of downstream surface waters so that they are not significantly altered from existing conditions during construction.

The project-specific SWPPP design and mitigation measures would be completed during final design in accordance with the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001), and the requirements of NYSDOT's Standard Specifications for Soil Erosion and Sediment Control (NYSDOT 2009). The *New York State Standards and Specifications for Erosion and Sediment Control* (NYSDEC 2005) and various other texts on storm water and water quality would be used to evaluate appropriate erosion and sedimentation mitigation measures. The critical elements of an SWPPP are described in Section 7 of this appendix.

The use of proper design standards, inspections during construction, and regular cleaning and maintenance of erosion and sediment control features would minimize the potential for erosion and sedimentation during and after construction.



6.4 Environmental Performance Commitments

The use of best management practices and the enforcement of Environmental Performance Commitments (EPCs) included within the construction contracts would ensure that construction activities adjacent to the Black Rock Canal would not impact water quality and would not lead to any subsequent indirect impact on aquatic habitats downstream of the Project area. Any potential impacts to water quality would be short-term, minor, and limited to the area immediately adjacent to the construction zone.

Critical Elements for a Stormwater Pollution Prevention Plan

During the construction and post-construction periods, erosion and sedimentation must be controlled to prevent adverse impacts on the Project area's topography, water quality and quantity, storm drainage systems/pathways, and existing or potential vegetation. Erosion can occur when open excavations, disturbed areas, and soil stockpiles are exposed to wind, the vertical force of rain, and storm water runoff. Sedimentation occurs when water velocities decrease and suspended particles settle out, collecting in storm sewers and drainage ways, including Waters of the United States.

Sensitive on-site and adjacent off-site areas that may be affected by the Project include surface water bodies, public recreation areas, and residential and commercial properties. An SWPPP would be prepared during final design that addresses each stage of the Project, from initial construction mobilization to post-construction. Erosion control would be critical for soil stabilization, control of runoff, and prevention of sedimentation. Storm water management and minimizing the effects of wind are essential to controlling erosion and sedimentation. Methods and practices used to manage storm water runoff and wind exposure within the Project Area would vary from temporary to permanent, depending on site-specific characteristics.

7.1 Storm Water Management

The SWPPP would detail the site-specific methods that would be implemented to control or reduce the rate of storm water runoff, reduce potential erosion of exposed soil, and minimize potential flooding. Engineering controls such as diversion ditches, vegetative swales, and retention/detention ponds/systems would be designed into the Project.

7.2 Wind Management

Wind is an almost constant condition that must be considered due to the Project's location on the leeward edge of Lake Erie. Dust arising from construction sites can cause off-site nuisance, damage, and traffic safety problems. The SWPPP would identify and define controls to prevent or reduce wind erosion and dust during and after construction activities. Soil stockpiles would need to be protected from the wind. Construction activities should be scheduled to minimize the extent of disturbed areas at any one time, thus avoiding the exposure of large are-



7 Critical Elements for a Stormwater Pollution Prevention Plan

as of open soil to the adverse effects of wind. Vegetative cover, mulch, spray adhesives, water sprinkling, and wind barriers also may be employed.

References

- New York State Department of Environmental Conservation (NYSDEC), 2005, New York State Standards and Specifications for Erosion and Sediment Control, Albany, New York.
- New York State Department of Transportation (NYSDOT), 1995, *Environmental Procedures Manual*, Chapter 4.5, Water Quality Standards and Assessment Methodologies.
- ______, 2009, Standard Specifications, Soil Erosion and Sediment Control, Albany, New York.
- United States Department of Transportation (USDOT), 1990, *Pollutant Loadings* and *Impacts from Highway Stormwater Runoff, Federal Highway Administration*, Publication No. FHWA-RD-88-006, April 1990.



A Toler Method Analysis

Attachment A

Toler Method Analysis



Toler Method Analysis Calculations & Discussion

Evaluation of Impacts to Water Quality

The addition of Ramp D, the removal of Baird Drive, and the change to the vehicular entrance to Front Park proposed by the NY Gateway Connections Improvement Project to the U.S. Peace Bridge Plaza (Project) results in an overall reduction in the existing impervious pavement area associated with the current vehicular entrance and exit to the Plaza. It is these impervious pavement areas where de-icing chemicals are applied seasonally that are of concern. Soil and groundwater will not be affected by this Project due to presence of an established storm water runoff collection and containment system that collect stormwater from the current paved areas and discharges the runoff to the Buffalo Sewer Authority's Bird Island Waste Water Treatment System or the Black Rock Canal. The new paved area will be designed to collect and transport storm water to the existing system and eliminate almost all runoff; thus minimizing the potential for impacts to nearby surface waterbodies (i.e., Black Rock Canal and ultimately, the Niagara River).

Approximately 11,765 ft² less of impervious area will exist as a result of this proposed Project. **Table 1** identifies the proposed change in impervious pavement area within the Project Area.

Table 1: Proposed Changes to the Impervious Pavement Area Pavement (ft²)

Area of Change / Description of Action				
Area of Change/Description of Action	Existing	Proposed	Change	
Front Park			_	
Removal of Baird Drive	58,980	0	(58,980)	
Removal of Existing Vehicular Entrance	9,674	0	(9,674)	
New Vehicular Entrance	0	2,748	2,748	
Net Change in Pavement Area	68,654	2,748	(65,906)	
Ramps				
Construction of Ramp D	0	43,535	43,535	
Construction of Ramp PN	0	11,029	11,029	
Change in Ramp A Configuration	55,631	73,719	18,088	
Change in Ramps N and C Configuration	82,255	62,909	(19,346)	
Net Change in Pavement Area	137,886	191,192	53,306	
Porter Avenue				
Removal of Park vehicular entrance	8,755	6,301	(2,454)	
Addition of Roundabout	38,981	42,270	3,289	
Net Change in Pavement Area	47,736	48,571	835	
Impervious Pavement Totals	254,276	242,511	(11,765)	

The reduction in impervious area is expected to result in a decrease of five tons of salt used annually.

Methodology

The Toler Formula (NYSDOT, IPDG No.15) was used to determine the annual average concentration of chloride in the drainage basin. A chloride concentration above 250mg/L in the storm water that is being discharged into the Black Rock Canal is considered to have a negative impact on the ecological conditions of the receiving waters.

The Toler Formula is as follows:

$$\frac{T \times M}{I \times A} \times K = C$$

Where:

T = Tons of salt per lane mile

M = Number of lane miles

I = Inches of runoff (40% of annual inches of rain)

A = Drainage area in square miles

K = 8.37 for chloride

C = Annual average concentration in mg/L

A shock factor of 2 was used to determine shock load concentration.

The amount of de-icing salt applied to local interstate roadways (tons of salt used per lane mile) was obtained from the New York State Thruway Authority Maintenance Division salt use records from 1978 to present. The average salt usage for the I-190 was 36.0 tons per lane mile.

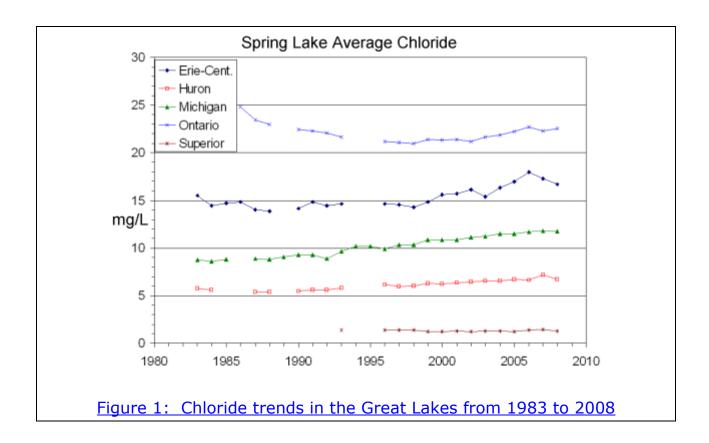
The number of lane miles was determined by dividing the area (ft²) of impervious pavement by 12 (estimated average lane width) and then divided by 5280 feet/mile.

Lake Erie's current chlorine concentration is 15 to 20 mg/L (see EPA graph below). Lake Erie flows directly into the Niagara River and the Black Rock Canal and water quality is assumed to be identical in this region.

Results

The Toler Method Analysis was performed for the Project and indicates that chloride concentrations from de-icing chemicals would not alter or otherwise affect the concentration of the waters of the Black Rock Canal or the Niagara River. Anticipated chloride concentration is 0.0001 mg/L for the proposed condition and shock load concentration is 0.0002 mg/L. This is

below the toxicity criterion (250 mg/L) set by the New York State Department of Transportation.





B Pollutant Metals Analysis

Attachment B

Pollutant Metals Analysis

New York Gateway

Attachment B - Concentration Calculations for Pollutant Loadings and Impacts from Highway Storm Water Runoff Calculations for Once-in-Three-Year Stream Pollutant Concentrations (No Build Condition)

Worksheet A

Worksheet A	### ### ##############################			
Site Characteristic				
1 Drainage Area o	f Highway Segment			
а	Total right of way	(acres)	AROW	7.15
b	Paved Surface	(acres)	AHWY	5.84
С	Percent Impervious (=100*AHWY/A	ROW)	IMP	81.7
2. Rainfall Charact	parietics		MEAN	
	Volume	(inch)	MVP	0.26
la L		(inch/hour)		0.20
b	Intensity	, , ,	MIP	, ,
C	Duration	(hour)	MDP	5.8
ld	Interval	(hour)	MTP	73
			COEF of V	ARIATION
e	Volume	(dimensionless)	CVVP	1.46
f	Intensity	(dimensionless)	CVIP	1.31
g	Duration	(dimensionless)	CVDP	1.05
h	Interval	(dimensionless)	CVTP	1.07
_				
<u> </u>	Number of storms per year (24*365	5/MTP)	NST	120
	•			
3. Surrounding Arc				
а	ADT usually over 30,000 vehicles/d	ay	URBAN	YES
b	or ADT usually under 30,000 vpd, und	eveloned or suburban	RURAL	NO
<u>L</u>	7151 usuany under so,oos vpu, und	everoped of Suburbur		
4. Select pollutant	for analysis and estimate runoff qual	ity characteristics		Copper
а	Site median concentration	(mg/l)	TCR	0.054
b	coef of variation (0.71 urban; 0.84 I	Rural)	CVCR	0.71
5. Select receiving	water target concentration surface water Total Hardness	(mg/l)	TH	150
<u> </u>	Sarrace Water Fotor Hardness	(1116/1)		
STREAM		18 br		
а	EPA Acute Criterion	(mg/l)	CTA	0.026
b	Suggested Threshold Effect Level	(mg/l)	стт	0.06
6 Watershed Drai	nage Area (square miles)		ATOT	22,720
	way for a stream - total contributing are	ea for a lake	7.1.01	,,
	•			
7. Average annual				
а	Unit area flow rate (CFS) per square	e mile	QSM	1.6
b	Coef of variation of stream flows		CVQS	1.5
lc	Average stream flow (QSM*ATOT)	(CFS)	MQS	36,352

(No Build Condition)

A11444100011000110001000100000000000000	off Characteristics		
· · · · ·	unoff coefficient (Rv)		04.60
a	Percent Imperious (Worksheet A - Item 1c)	IMP	81.68
b	Runoff Coefficient (=0.007*IMP+0.1)	Rv	0.672
2. Compute ru	unoff flow rates		
а	Flow Rate from mean storm (CFS)		
	=Rv*MIP*AROW	MQR	0.24
b	Coefficent of variation of runoff volumes		
	=CVIP (Worksheet A - Item 2f)	CVQR	1.31
3. Compute re	unoff volume		
а	Volume from the mean storm (CF)		
	=Rv*MVP*AROW*3630	MVR	4,533
ь	Coefficient of variation of runoff volumes		,
	=CVVP (Worksheet A - Item 2e)	CVVP	1.46
	_		
4. Compute N		TOD	0.054
	Site Median Concentration (Worksheet A - Item 4a)	TCR	0.054
	Coef of var. of site EMC's (Worksheet A - 4b)	CVCR	0.71
	Number of storms per year (Worksheet a - 2i)	NST	120
а	mean event concentration (MCR) (mg/l)		
	= TCR*SQRT(1+CVCR^2)	MCR	0.066
Ь	mean event mass load (pounds)		
	= MCR*MVR*(0.00006245)	M(MASS)	0.02
c	annual mass load from runoff (pounds/yr)		
	=M(MASS)*NST	ANMASS	2.25
5 Compute fl	ow ratio (MQS/MQR)	***************************************	
a. Compute ii	ratio of average stream flow (Worksheet A -7b)		
a	to MQR	MQS/MQR	148,404
			,

(No Build Condition)

ksheet C				
am Impaci		10.11 20.11 20.11	F. 100/100	4 40 40
efine the f	low ratio MQS/MQR (Worksheet B-5a)		MQS/MQR	148,404
mpute th	e event frequency for a 3 year recurrence interval			
а	Enter the average number of storms per year			
	(from Worksheet A - item 2i)		NST	120
b	Compute the probability (%) of the three-year event			
	=100*(1/(NST*3))		PR	0.28
ter value f	rom table 7			
	for MQS/MQR and frequencey PR	(mg/l)	CU	0.0059
lect pollu	tant for analysis			Coppe
а	Site median concentration	(mg/l)	TCR	0.054
b	Solube fraction	, 3. ,	FSOL	0.4
	(Copper: 40%; Lead: 10%; Zinc: 40%)			
c	Acute Criteria Value	(mg/l)	CTA	0.026
ď	Threshold effects level	(mg/l)	CTT	0.06
		, O, 7	-1-1000000	
mpute th	e once in 3 year stream pollutant concentration			
	=CU*TCR*FSOL	(mg/l)	СО	0.0001
	th toward consentration CTA			
Impare wi	th target concentration, CTA =CO/CTA		CRAT	0.005
<u> </u>	A STATE OF THE STA			
alute resu	lts ·			
а	If CRAT is less than about 0.75	-		STOP
	A toxicity problem attributable to this pollutant is unlikely			
b	If CRAT is greater than 5 reduction will definitely be required			
	Estimate the level of reduction possible and repeat the analysis wit	:h	•	
	revised value for either concentration or flow or both			
	If CDAT is still assessment and anadequation leviles are not o	ractical		
C	If CRAT is still greater than 1 and greater reduction levies are not p	i acticai		

CRTE

0.00

violation) by a comparison with the threshold effects level

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New York Gateway

Attachment B - Concentration Calculations for Pollutant Loadings and Impacts from Highway Storm Water Runoff Calculations for Once-in-Three-Year Stream Pollutant Concentrations (Build Condition)

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Worksheet A				EM School	
Site Characte	ristics				
1 Drainage A	re <u>a of</u>	Highway Segment			
	а	Total right of way	(acres)	AROW	7.15
	b	Paved Surface	(acres)	AHWY	5.57
	С	Percent Impervious (=100*AHWY/A	ROW)	IMP	77.9
2. Rainfall Ch	aracte	eristics		MEAN	
	а	Volume	(inch)	MVP	0.26
	b	Intensity	(inch/hour)	MIP	0.051
	С	Duration	(hour)	MDP	5.8
	d	Interval	(hour)	MTP	73
	L				
				COEF of V	ARIATION
	e	Volume	(dimensionless)	CVVP	1.46
	f	Intensity	(dimensionless)	CVIP	1.31
	g	Duration	(dimensionless)	CVDP	1.05
	lh	Interval	(dimensionless)	CVTP	1.07
	L			1	
	lī	Number of storms per year (24*365	S/MTP)	NST	120
	Ľ	rtanisel el eternio per year (± 1 e e			
3. Surroundir	ng Are	a Type			
5.54544	a	ADT usually over 30,000 vehicles/da	av	URBAN	YES
	ш_	or	ч	UND/ III	
	b	ADT usually under 30,000 vpd, under	eveloped or suburban	RURAL	NO
		, to r assault and e. co, coo tpa, and			,,,,
4. Select poll	utant	for analysis and estimate runoff quali	ity characteristics		Copper
	а	Site median concentration			
		Site median concentration	(mg/I)	TCR	0.054
	4		(mg/l) Rural)	TCR CVCR	
	b	coef of variation (0.71 urban; 0.84 F	· = ·		0.054 0.71
5. Select rece	b	coef of variation (0.71 urban; 0.84 F	· = ·		
5. Select rece	b		Rural)		
5. Select rece	b	coef of variation (0.71 urban; 0.84 F	· = ·	CVCR	0.71
5. Select rece	b	coef of variation (0.71 urban; 0.84 F	Rural)	CVCR	0.71
20 G Black (1984) - Ar halfer whole facilities on Ferral Association (1984)	beiving	coef of variation (0.71 urban; 0.84 F water target concentration surface water Total Hardness	Rural) (mg/l)	CVCR	150
20 G Black (1984) - Ar halfer whole facilities on Ferral Association (1984)	b eiving	coef of variation (0.71 urban; 0.84 F water target concentration surface water Total Hardness EPA Acute Criterion	(mg/l) (mg/l)	CVCR TH	0.71
and distributed the control of the c	beiving	coef of variation (0.71 urban; 0.84 F water target concentration surface water Total Hardness	Rural) (mg/l)	TH CTA	0.71
STREAM	b Priving a b	water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level	(mg/l) (mg/l)	TH CTA CTT	0.71 150 0.026 0.06
STREAM 6.Watershed	b eiving a b	coef of variation (0.71 urban; 0.84 F water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level	(mg/l) (mg/l) (mg/l) (mg/l)	TH CTA	0.71
STREAM 6.Watershed	b eiving a b	water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level	(mg/l) (mg/l) (mg/l) (mg/l)	TH CTA CTT	0.71 150 0.026 0.06
STREAM 6.Watershed upstream of I	a b Drain	water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level age Area (square miles) ay for a stream - total contributing are	(mg/l) (mg/l) (mg/l) (mg/l)	TH CTA CTT	0.71 150 0.026 0.06
STREAM 6.Watershed	a b Drain	water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level age Area (square miles) ay for a stream - total contributing are	(mg/l) (mg/l) (mg/l) ea for a lake	TH CTA CTT	0.71 150 0.026 0.06
STREAM 6.Watershed upstream of I	a b Drain	water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level age Area (square miles) ay for a stream - total contributing are	(mg/l) (mg/l) (mg/l) ea for a lake	CVCR TH CTA CTT ATOT	0.71 150 0.026 0.06 22,720

(Build Condition)

Worksheet B

	noff coefficient (Rv) Percent Imperious (Worksheet A - Item 1c)	IMP	77.90
a b	· · · · · · · · · · · · · · · · · · ·	Rv	0.645
В	Runoff Coefficient (=0.007*IMP+0.1)	KV	0.043
put <u>e ru</u>	noff flow rates		
а	Flow Rate from mean storm (CFS)		
	=Rv*MIP*AROW	MQR	0.24
b	Coefficent of variation of runoff volumes		
	=CVIP (Worksheet A - Item 2f)	CVQR	1.31
ipute ru	noff volume		
а	Volume from the mean storm (CF)		
	=Rv*MVP*AROW*3630	MVR	4,355
Ь	Coefficient of variation of runoff volumes		
	=CVVP (Worksheet A - Item 2e)	CVVP	1.46
pute M			
	Site Median Concentration (Worksheet A - Item 4a)	TCR	0.054
	Coef of var. of site EMC's (Worksheet A - 4b)	CVCR	0.71
L	Number of storms per year (Worksheet a - 2i)	NST	120
а	mean event concentration (MCR) (mg/l)		
	= TCR*SQRT(1+CVCR^2)	MCR	0.066
Ь	mean event mass load (pounds)		
	= MCR*MVR*(0.00006245)	M(MASS)	0.02
С	annual mass load from runoff (pounds/yr)		
	=M(MASS)*NST	ANMASS	2.16
pute flo	ow ratio (MQS/MQR)		
pute flo	ratio (MQS/MQR) ratio of average stream flow (Worksheet A -7b)	1, - 1,000	

(Build Condition)

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ream Impa	ct Analysis		1.0630 Maria Cara	
Define the	flow ratio MQS/MQR (Worksheet B-5a)	在现代,可以是一种的人,但是一种的人,但是一种的人,但是一种的人,但是一种的人,但是一种的人,也可以是一种的人,也可以是一种的人,也可以是一种的人,也可以是一种的人,	MQS/MQR	154,48 3
Compute t	the event frequency for a 3 year recurrence interval			
а	Enter the average number of storms per year			
	(from Worksheet A - item 2i)		NST	120
b	Compute the probability (%) of the three-year event			
	=100*(1/(NST*3))		PR	0.28
Enter value	e from table 7			
	for MQS/MQR and frequencey PR	(mg/l)	CU	0.0058
Select poll	utant for analysis			Copper
a	Site median concentration	(mg/l)	TCR	0.054
b	Solube fraction		FSOL	0.4
	(Copper: 40%; Lead: 10%; Zinc: 40%)			
c	Acute Criteria Value	(mg/l)	CTA	0.026
d	ratio MQS/MQR (Worksheet B-5a) ent frequency for a 3 year recurrence interval ter the average number of storms per year mow Worksheet A - item 2i) mpute the probability (%) of the three-year event 100*(1/(NST*3)) PR 1 table 7 MQS/MQR and frequencey PR (mg/l) CU 0. for analysis ce median concentration ube fraction poper: 40%; Lead: 10%; Zinc: 40%) ute Criteria Value (mg/l) CTA (mg/l) CT	0.06		
`omnute t	the once in 3 year stream pollutant concentration	-		
Sompate t	=CU*TCR*FSOL	(mg/l)	со	0.0001
Compare v	=CO/CTA		CRAT	0.005
				-
valute res				STOP
а				3101
b	, ,			
ا		ic with		
	•	15 WILLI		
	·	not practical	•	
C	Estimate the potential for an adverse impact (as opposed to a			
	violation) by a comparison with the threshold effects level	CITCITA		

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New York Gateway

Attachment B - Concentration Calculations for Pollutant Loadings and Impacts from Highway Storm Water Runoff Calculations for Once-in-Three-Year Stream Pollutant Concentrations (No Build Condition)

Worksheet A

1 Drainage Area of Highway Segment a Total right of way (acres) AROW 7.15 b Paved Surface (acres) AHWY 5.84 c Percent Impervious (=100*AHWY/AROW) IMP 81.7 2. Rainfall Characteristics MEAN a Volume (inch) MVP 0.26 b Intensity (inch/hour) MIP 0.051 c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVIP 1.31 g Duration (dimensionless) CVIP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) Upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile b Coef of variation of stream flows C CVCR 3.6352	Site Charac				
Total right of way	-41 E-cherosyphean signmon signing				
c Percent Impervious (=100*AHWY/AROW) IMP 81.7 2. Rainfall Characteristics MEAN a Volume (inch) MVP 0.26 b Intensity (inch/hour) MIP 0.051 c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVIP 1.05 h Interval (dimensionless) CVIP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5			(acres)	AROW	7.15
2. Rainfall Characteristics a Volume (inch) MVP 0.26 b Intensity (inch/hour) MIP 0.051 c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVIP 1.05 h Interval (dimensionless) CVTP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	ь	Paved Surface	(acres)	AHWY	5.84
a Volume (inch) MVP 0.26 b Intensity (inch/hour) MIP 0.051 c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVIP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/I) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/I) TH 150 STREAM a EPA Acute Criterion (mg/I) CTA 0.137 b Suggested Threshold Effect Level (mg/I) CTT 0.6 6. Watershed Drainage Area (square miles) Acute CVCR 1.5 coef of variation of stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	с	Percent Impervious (=100*AHWY/A	ROW)	IMP	81.7
a Volume (inch) MVP 0.26 b Intensity (inch/hour) MIP 0.051 c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVIP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/I) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) TCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/I) TH 150 STREAM a EPA Acute Criterion (mg/I) CTA 0.137 b Suggested Threshold Effect Level (mg/I) CTT 0.6 6. Watershed Drainage Area (square miles) upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	2 Painfall	Characteristics		MEAN	
b Intensity (inch/hour) MIP 0.051 c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVDP 1.05 h Interval (dimensionless) CVTP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVOS 1.5			(inch)		0.26
c Duration (hour) MDP 5.8 d Interval (hour) MTP 73 COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVVP 1.45 g Duration (dimensionless) CVP 1.05 h Interval (dimensionless) CVTP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) TH 150 STREAM a EPA Acute Criterion (mg/l) TH 150 STREAM b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles)					
COEF of VARIATION		·	• • •		i
COEF of VARIATION e Volume (dimensionless) CVVP 1.46 f Intensity (dimensionless) CVIP 1.31 g Duration (dimensionless) CVDP 1.05 h Interval (dimensionless) CVTP 1.07 I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5			•		
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I Number of storms per year (24*365/MTP) NST 120 3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	f	Intensity	(dimensionless)	CVIP	1.31
3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	g	Duration	(dimensionless)	CVDP	1.05
3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) TATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	h	Interval ·	(dimensionless)	CVTP	1.07
3. Surrounding Area Type a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) TATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5					
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a ADT usually over 30,000 vehicles/day URBAN YES or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics Lead a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5					
or b ADT usually under 30,000 vpd, undeveloped or suburban RURAL NO 4. Select pollutant for analysis and estimate runoff quality characteristics a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5					VEC
4. Select pollutant for analysis and estimate runoff quality characteristics a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	а		ay .	URBAN	YES.
4. Select pollutant for analysis and estimate runoff quality characteristics a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	Ь		aveloned or suburban	RURAL	NO
a Site median concentration (mg/l) TCR 0.4 b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	<u> </u>	ADT usually under 30,000 vpu, under	eveloped of Sabarban	NONAL	INO
b coef of variation (0.71 urban; 0.84 Rural) CVCR 0.71 5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	4. Select po	ollutant for analysis and estimate run	off quality characteristics		Lead
5. Select receiving water target concentration surface water Total Hardness (mg/l) TH 150 STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6. Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	a	Site median concentration	(mg/l)	TCR	0.4
STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	b	coef of variation (0.71 urban; 0.84 F	Rural)	CVCR	0.71
STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5					
STREAM a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) ATOT 22,720 upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	5. Select re		(ma/l)	TU	150
a EPA Acute Criterion (mg/l) CTA 0.137 b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	l	Surface Water Total Hardiness	(1118/1)	111	130
b Suggested Threshold Effect Level (mg/l) CTT 0.6 6.Watershed Drainage Area (square miles) upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	STREAM				
6. Watershed Drainage Area (square miles) upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	а	EPA Acute Criterion			1
upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	b	Suggested Threshold Effect Level	(mg/l)	СТТ	0.6
upstream of highway for a stream - total contributing area for a lake 7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5	C Makanah	ad Dunimana Aura (aurana milan)		ATOT	22 720
7. Average annual stream flow a Unit area flow rate (CFS) per square mile QSM 1.6 b Coef of variation of stream flows CVQS 1.5			uting area for a lake	ATOT	22,720
aUnit area flow rate (CFS) per square mileQSM1.6bCoef of variation of stream flowsCVQS1.5	upstream c	or nighway for a stream - total contribu	itilig area for a lake		
b Coef of variation of stream flows CVQS 1.5	7. Average	annual stream flow	•		
	a	Unit area flow rate (CFS) per square	mile	QSM	1.6
c Average stream flow (QSM*ATOT) (CFS) MQS 36,352	b	Coef of variation of stream flows		CVQS	1.5
	С	Average stream flow (QSM*ATOT)	(CFS)	MQS	36,352

Lead

(No Build Condition)

Workshee			
discolate becomes well and the	tunoff Characteristics		
1. Comput	e runoff coefficient (Rv)		
а	Percent Imperious (Worksheet A - Item 1c)	IMP	81.68
b	Runoff Coefficient (=0.007*IMP+0.1)	Rv	0.672
2. Comput	e runoff flow rates		
а	Flow Rate from mean storm (CFS)		
İ	=Rv*MIP*AROW	MQR	0.24
b	Coefficent of variation of runoff volumes		
	=CVIP (Worksheet A - Item 2f)	CVQR	1.31
3. Comput	e runoff volume		
a	Volume from the mean storm (CF)		
	=Rv*MVP*AROW*3630	MVR	4,533
Ь	Coefficient of variation of runoff volumes		
	=CVVP (Worksheet A - Item 2e)	CVVP	1.46
4 Camara	Mana		
4. Comput	Site Median Concentration (Worksheet A - Item 4a)	TCR	0.4
	Coef of var. of site EMC's (Worksheet A - 4b)	CVCR	0.71
	Number of storms per year (Worksheet a - 2i)	NST	120
	Number of Storms per year (Worksheet a - 21)	1431	120
а	mean event concentration (MCR) (mg/l)		
	= TCR*SQRT(1+CVCR^2)	MCR	0.491
b	mean event mass load (pounds)		
	= MCR*MVR*(0.00006245)	M(MASS)	0.14
c	annual mass load from runoff (pounds/yr)		
	=M(MASS)*NST	ANMASS	16.66
5. Comput	te flow ratio (MQS/MQR)		
a	ratio of average stream flow (Worksheet A -7b)		
	to MQR	MQS/MQR	148,404

(No	Build	Condition	١
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W	or	ksł	1e	et C	•
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efine	the flow ratio MQS/MQR (Worksheet B-5a)		MQS/MQR	148,40
mpu	te the event frequency for a 3 year recurrence interval			
а	Enter the average number of storms per year			
	(from Worksheet A - item 2i)		NST	12
b	Compute the probability (%) of the three-year event			
	=100*(1/(NST*3))		PR	0.2
ter va	alue from table 7			
	for MQS/MQR and frequencey PR	(mg/l)	CU	0.005
lect i	pollutant for analysis			Lea
a :	Site median concentration	(mg/l)	TCR	0
b	Solube fraction		FSOL	0
	(Copper: 40%; Lead: 10%; Zinc: 40%)			
С	Acute Criteria Value	(mg/l)	СТА	0.13
d	Threshold effects level	(mg/l)	СТТ	0
	to the area in 2 year stream nellytant concentration			
mpu	te the once in 3 year stream pollutant concentration =CU*TCR*FSOL	(mg/l)	СО	0.000
	and with the second sec			
mpa	re with target concentration, CTA =CO/CTA		CRAT	0.00
	-co/cia		CIAI	0.00
alute	results			
а	If CRAT is less than about 0.75			STC
	A toxicity problem attributable to this pollutant is unlikely			
b	If CRAT is greater than 5 reduction will definitely be required			
	Estimate the level of reduction possible and repeat the analysis with			
	revised value for either concentration or flow or both			
С	If CRAT is still greater than 1 and greater reduction levles are not prac	tical		
	Estimate the potential for an adverse impact (as opposed to a criteria			
	violation) by a comparison with the threshold effects level			
1	=CO/CTT		CRTE	0.0

New York Gateway

Attachment B - Concentration Calculations for Pollutant Loadings and Impacts from Highway Storm Water Runoff Calculations for Once-in-Three-Year Stream Pollutant Concentrations (Build Condition)

W	or	ks	he	et	Α

		A Company of the Comp		
Distriction of the A	cteristics			
inage	Area of Highway Segment			
а	Total right of way	(acres)	AROW	7.
b	Paved Surface	(acres)	AHWY	5.
С	Percent Impervious (=100*AHWY/A	AROW)	IMP	77
infall	Characteristics		MEAN	
а	Volume	(inch)	MVP	0.
ь	Intensity	(inch/hour)	MIP	0.0
c	, Duration	(hour)	MDP	!
đ	Interval	(hour)	MTP	
			COEF of V	ARIATIO
e	Volume	(dimensionless)	CVVP	1
f	Intensity	(dimensionless)	CVIP	1
g	Duration	(dimensionless)	CVDP	1
h	Interval	(dimensionless)	CVTP	1
1	Number of storms per year (24*36	5/MTP)	NST	
rroun	ding Area Type			
rroun	ding Area Type ADT usually over 30,000 vehicles/d or		URBAN	
	ADT usually over 30,000 vehicles/d	ay	URBAN RURAL	YES
a b	ADT usually over 30,000 vehicles/d or	ay eveloped or suburban	RURAL	YES NC
a b	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und	ay eveloped or suburban	RURAL	YE: NC Lea
a b lect p	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate run	ay eveloped or suburban off quality characteristic (mg/l)	RURAL	YE: NC Lea
b lect p a b	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate rune Site median concentration	ay eveloped or suburban off quality characteristic (mg/l)	RURAL s	YE: NC Lea
b lect p a b	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate rune Site median concentration coef of variation (0.71 urban; 0.84 l	ay eveloped or suburban off quality characteristic (mg/l)	RURAL s	NC Lea
b lect p a b	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce Site median concentration coef of variation (0.71 urban; 0.84 left).	ay eveloped or suburban off quality characteristic (mg/l) Rural)	RURAL s TCR CVCR	NC Lea
b lect p a b	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce Site median concentration coef of variation (0.71 urban; 0.84 left).	ay eveloped or suburban off quality characteristic (mg/l) Rural) (mg/l)	RURAL s TCR CVCR	YES NC Lea 0
lect p	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce Site median concentration coef of variation (0.71 urban; 0.84 l . ecceiving water target concentration surface water Total Hardness	ay eveloped or suburban off quality characteristic (mg/l) Rural)	RURAL s TCR CVCR	YES NO Lea 0
lect p a b lect re	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce Site median concentration coef of variation (0.71 urban; 0.84 leceiving water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level	eveloped or suburban off quality characteristic (mg/l) Rural) (mg/l) (mg/l)	RURAL s TCR CVCR TH CTA CTT	VES NC Lea 0
b lect p a b lect ro	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce of the state of the s	eveloped or suburban off quality characteristic (mg/l) Rural) (mg/l) (mg/l) (mg/l)	RURAL s TCR CVCR TH	YES NC Lea 0
lect p a b lect re a b atersh	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce of standard concentration coef of variation (0.71 urban; 0.84 leceiving water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level	eveloped or suburban off quality characteristic (mg/l) Rural) (mg/l) (mg/l) (mg/l)	RURAL s TCR CVCR TH CTA CTT	VES NC Lea
lect p a b lect re a b atersh	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runce of the state of the s	ay eveloped or suburban off quality characteristic (mg/l) Rural) (mg/l) (mg/l) (mg/l) (mg/l)	RURAL s TCR CVCR TH CTA CTT	VES NC Lea 0
lect p a b lect re a b atersh ream	ADT usually over 30,000 vehicles/d or ADT usually under 30,000 vpd, und ollutant for analysis and estimate runch of site median concentration coef of variation (0.71 urban; 0.84 leceiving water target concentration surface water Total Hardness EPA Acute Criterion Suggested Threshold Effect Level eed Drainage Area (square miles) of highway for a stream - total contribute annual stream flow	ay eveloped or suburban off quality characteristic (mg/l) Rural) (mg/l) (mg/l) (mg/l) (mg/l)	RURAL s TCR CVCR TH CTA CTT ATOT	VES NC Lea 0 0 1 1 22,7

Lead

(Build Condition)

Worksheet B			
Highway Run	off Characteristics		
1. Compute ru	noff coefficient (Rv)		
а	Percent Imperious (Worksheet A - Item 1c)	IMP	77.90
b	Runoff Coefficient (=0.007*IMP+0.1)	Rv	0.645
2. Compute ru	noff flow rates		
а	Flow Rate from mean storm (CFS)		
	=Rv*MIP*AROW	MQR	0.24
b	Coefficent of variation of runoff volumes		
	=CVIP (Worksheet A - Item 2f)	CVQR	1.31
3. Compute ri	unoff volume		
a	Volume from the mean storm (CF)		
	=Rv*MVP*AROW*3630	MVR	4,355
b	Coefficient of variation of runoff volumes		
	=CVVP (Worksheet A - Item 2e)	CVVP	1.46
1. Compute N	lass		
	Site Median Concentration (Worksheet A - Item 4a)	TCR	0.4
	Coef of var. of site EMC's (Worksheet A - 4b)	CVCR	0.71
	Number of storms per year (Worksheet a - 2i)	NST	120
_	man control of the state of AACD (mg/l)		
a	mean event concentration (MCR) (mg/l)	MCR	0.491
	= TCR*SQRT(1+CVCR^2)	WICK	0.491
b	mean event mass load (pounds)	NA/NAACC)	0.12
L	= MCR*MVR*(0.00006245) annual mass load from runoff (pounds/yr)	M(MASS)	0.13
C	annual mass load from runoff (pounds/yr) =M(MASS)*NST	ANMASS	16.01
· -	ow ratio (MQS/MQR)		
a	ratio of average stream flow (Worksheet A -7b) to MQR	MQS/MQR	154,483
L-man			

	read			
Build Con	dition)			
/orkshee	t C			and the second of the second second
tream Im	pact Analysis		200 000 000	
. Define t	he flow ratio MQS/MQR (Worksheet B-5a)		MQS/MQR	154,483
. Comput	e the event frequency for a 3 year recurrence interval			
а	Enter the average number of storms per year			
	(from Worksheet A - item 2i)		NST	120
b	Compute the probability (%) of the three-year event			
ŀ	=100*(1/(NST*3))		PR	0.28
-				
Enter va	ue from table 7			
	for MQS/MQR and frequencey PR	(mg/l)	CU	0.0058
Calaat w	ollutant for analysis			Lead
a	Site median concentration	(mg/l)	TCR	0.4
ľb	Solube fraction	(1116/1/	FSOL	0.4
ľ	(Copper: 40%; Lead: 10%; Zinc: 40%)		1301	0.1
c	Acute Criteria Value	(mg/l)	СТА	0.137
d	Threshold effects level	(mg/l)	CTT	0.137
<u> </u>	Threshold effects level	(1118/1)		0.0
Comput	e the once in 3 year stream pollutant concentration			
	=CU*TCR*FSOL	(mg/l)	СО	0.0002
Compar	e with target concentration, CTA			
	=CO/CTA		CRAT	0.002
Evalute ı				
а	If CRAT is less than about 0.75			STOP
	A toxicity problem attributable to this pollutant is unlikely			
b	If CRAT is greater than 5 reduction will definitely be required			

Estimate the level of reduction possible and repeat the analysis with

If CRAT is still greater than 1 and greater reduction levles are not practical... Estimate the potential for an adverse impact (as opposed to a criteria

revised value for either concentration or flow or both

=CO/CTT

violation) by a comparison with the threshold effects level

CRTE

0.00

New York Gateway

Attachment B - Concentration Calculations for Pollutant Loadings and Impacts from Highway Storm Water Runoff Calculations for Once-in-Three-Year Stream Pollutant Concentrations (No Build Condition)

Worksheet A

Worksheet A				
Site Characteristic				and the second
L Drainage Area of	Highway Segment			
а	Total right of way	(acres)	AROW	7.15
b	Paved Surface	(acres)	AHWY	5.84
с	Percent Impervious (=100*AHWY/A	ROW)	IMP	81.7
N. Datinfall Channel			NAT A SI	
2. Rainfall Charact		(1)	MEAN	2.25
а	Volume	(inch)	MVP	0.26
b	Intensity	(inch/hour)	MIP	0.051
c	Duration	(hour)	MDP	5.8
d	Interval	(hour)	MTP	73
			COEF of VA	ARIATION
e	Volume	(dimensionless)	CVVP	1.46
f	Intensity	(dimensionless)	CVIP	1.31
g	Duration	(dimensionless)	CVDP	1.05
h	Interval	(dimensionless)	CVTP	1.07
	(0.1)00	. /		400
<u> </u>	Number of storms per year (24*365	o/MTP)	NST	120
3. Surrounding Are	aa Tyne			
a	ADT usually over 30,000 vehicles/da	av	URBAN	YES
<u> </u>	or			
b	ADT usually under 30,000 vpd, und	eveloped or suburban	RURAL	NO
	, , , , , , , , , , , , , , , , , , ,			
· -	for analysis and estimate runoff qual		TCD	Zinc
a	Site median concentration	(mg/l)	TCR	0.329
b	coef of variation (0.71 urban; 0.84 F	Rural)	CVCR	0.71
5. Select receiving	water target concentration			
	surface water Total Hardness	(mg/l)	TH	150
STREAM				
a	EPA Acute Criterion	(mg/l)	СТА	0.45
b			CTT	0.045
	Suggested Threshold Effect Level	(mg/l)	CII	0.945
C Marke well and Duelin		(mg/I)		
	nage Area (square miles)		АТОТ	22,720
upstream of highw	nage Area (square miles) ay for a stream - total contributing are			
upstream of highw	nage Area (square miles) ay for a stream - total contributing are	ea for a lake		
upstream of highw	nage Area (square miles) ay for a stream - total contributing are stream flow	ea for a lake	АТОТ	22,720

(No Build Condition)

Worksheet B

Workshee	lebitAndeli	ff Characteristics		
KONTRACTOR OF CHARGE	an heliophicae-a	noff coefficient (Rv)		
	а	Percent Imperious (Worksheet A - Item 1c)	IMP	81.68
	b	Runoff Coefficient (=0.007*IMP+0.1)	Rv	0.672
2. Comput	e rui	noff flow rates		
	a	Flow Rate from mean storm (CFS)		
		=Rv*MIP*AROW	MQR .	0.24
	b	Coefficent of variation of runoff volumes		
		=CVIP (Worksheet A - Item 2f)	CVQR	1.31
3 Comput	o rui	noff volume `		
J. Compac	a	Volume from the mean storm (CF)		
	ľ	=Rv*MVP*AROW*3630	MVR	4,533
	b	Coefficient of variation of runoff volumes	171711	1,555
	ľ	=CVVP (Worksheet A - Item 2e)	CVVP	1.46
	L	- CVVI (VVOINGREET) TEETH 207		21.10
4. Comput	е Ма	ass		
	Г	Site Median Concentration (Worksheet A - Item 4a)	TCR	0.329
		Coef of var. of site EMC's (Worksheet A - 4b)	CVCR	0.71
		Number of storms per year (Worksheet a - 2i)	NST	120
	а	mean event concentration (MCR) (mg/l)		
		= TCR*SQRT(1+CVCR^2)	MCR	0.403
	b	mean event mass load (pounds)		
		= MCR*MVR*(0.00006245)	M(MASS)	0.11
	С	annual mass load from runoff (pounds/yr)		
	L	=M(MASS)*NST	ANMASS	13.71
5. Comput	e flo	w ratio (MQS/MQR)		
	a	ratio of average stream flow (Worksheet A -7b)		
		to MQR	MQS/MQR	148,404

(No E	Build	Cond	ition))
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Worksheet C

tream Impact Ar	alysis		
. Define the flow	ratio MQS/MQR (Worksheet B-5a)	MQS/MQF	148,404
. Compute the e	vent frequency for a 3 year recurrence interval		
	a Enter the average number of storms per year		
	(from Worksheet A - item 2i)	NST	120
	b Compute the probability (%) of the three-year event		
	=100*(1/(NST*3))	PR	0.28
.Enter value fror	n table 7		
. [for MQS/MQR and frequencey PR (mg	;/I) CU	0.00593
. Select pollutan	t for analysis		Zino
· · · · · · · · · · · · · · · · · · ·	a Site median concentration (mg	;/l) TCR	0.329
	b Solube fraction	FSOL	0.4
	(Copper: 40%; Lead: 10%; Zinc: 40%)		
	c Acute Criteria Value (mg	(/I) CTA	0.45
	d Threshold effects level (mg		0.945
. Compute the o	nce in 3 year stream pollutant concentration =CU*TCR*FSOL (mg	z/I) CO	0.0008
	CTA		
. Compare with t	arget concentration, CTA =CO/CTA	CRAT	0.002
L			
Evalute results.'			
	a If CRAT is less than about 0.75		STOP
	A toxicity problem attributable to this pollutant is unlikely		
	b If CRAT is greater than 5 reduction will definitely be required		
	Estimate the level of reduction possible and repeat the analysis with		
	revised value for either concentration or flow or both		
	c If CRAT is still greater than 1 and greater reduction levles are not practical		
	Estimate the potential for an adverse impact (as opposed to a criteria		•
	violation) by a comparison with the threshold effects level		
1	=CO/CTT	CRTE	0.00

New York Gateway

Attachment B - Concentration Calculations for Pollutant Loadings and Impacts from Highway Storm Water Runoff Calculations for Once-in-Three-Year Stream Pollutant Concentrations (Build Condition)

а	f Highway Segment Total right of way	(acres)	AROW	7.1.
b	Paved Surface	(acres)	AHWY	5.5
С	Percent Impervious (=100*AHWY/A	ROW)	IMP	77.
ll Charact	teristics		MEAN	
а	Volume	(inch)	MVP	0.2
b	Intensity	(inch/hour)	MIP	0.05
c	Duration	(hour)	MDP	5.
d	Interval	(hour)	MTP	7
			COEF of V	ARIATIO
е	Volume	(dimensionless)	CVVP	1.4
- f	Intensity	(dimensionless)	CVIP	1.3
g	Duration	(dimensionless)	CVDP	1.0
h	Interval	(dimensionless)	CVTP	1.0
I	Number of storms per year (24*365	5/MTP)	NST	12
nding Ar	ea Type			
a	ADT usually over 30,000 vehicles/d	ay	URBAN	YES
	or			
b	ADT usually under 30,000 vpd, und	eveloped or suburban	RURAL	NO
pollutant	t for analysis and estimate runoff qual	ity characteristics		Zinc
а	Site median concentration	(mg/l)	TCR	0.32
b	coef of variation (0.71 urban; 0.84 f	Rural)	CVCR	0.7
receiving	g water target concentration			
	surface water Total Hardness	(mg/l)	TH	15
		Physics 19		
а	EPA Acute Criterion	(mg/l)	CTA	0.4
b	Suggested Threshold Effect Level	(mg/l)	СТТ	0.94
hed Drai	nage Area (square miles)		ATOT	22,72
- 6 - ! -	way for a stream - total contributing are	ea for a lake		
or nignv	,			
	l stream flow			
	,	e mile	QSM	1
ge annual	l stream flow	e mile	QSM CVQS	1 · 1

Average stream flow (QSM*ATOT)

(CFS)

MQS

36,352

Zinc

(Build Condition)

Worksheet B

Highway F	Runoff Ch	aracterist	ics	100

1. Compute runoff coefficient (Rv)

а	Percent Imperious (Worksheet A - Item 1c)	IMP	77.90
b	Runoff Coefficient (=0.007*IMP+0.1)	Rv	0.645

2. Compute runoff flow rates

а	Flow Rate from mean storm	(CFS)		
	=Rv*MIP*AROW		MQR	0.24
b	Coefficent of variation of runo	ff volumes		
	=CVIP (Worksheet A - Item 2f)		CVQR	1.31

3. Compute runoff volume

	,		
а	Volume from the mean storm (CF)		
	=Rv*MVP*AROW*3630	MVR	4,355
b	Coefficient of variation of runoff volumes		
-	=CVVP (Worksheet A - Item 2e)	CVVP	1.46

4. Compute Mass

Site Median Concentration (Worksheet A - Item 4a)	TCR	0.329
Coef of var. of site EMC's (Worksheet A - 4b)	CVCR	0.71
Number of storms per year (Worksheet a - 2i)	NST	120

а	mean event concentration (MC	R) (mg/l)		
	= TCR*SQRT(1+CVCR^2)		MCR	0.403
b	mean eveņt mass load	(pounds)		
	= MCR*MVR*(0.00006245)		M(MASS)	0.11
С	annual mass load from runoff	(pounds/yr)		
	=M(MASS)*NST		ANMASS	13.17

5. Compute flow ratio (MQS/MQR)

а	ratio of average stream flow (Worksheet A -7b)		
	to MQR	MQS/MQR	154,483

tream Impa	act Analysis			
. Define the	e flow ratio MQS/MQR (Worksheet B-5a)	And the second s	MQS/MQR	154,483
. Compute	the event frequency for a 3 year recurrence interval			
а	Enter the average number of storms per year			
	(from Worksheet A - item 2i)		NST	120
b	Compute the probability (%) of the three-year event			
	=100*(1/(NST*3))		PR	0.28
Enter valu	e from table 7			
Elitei vaiu	for MQS/MQR and frequencey PR	(mg/l)	CU	0.0058
<u> </u>	To Mice / Michigan and medicines / Th	(יי/פייי)		0.0000
Select pol	lutant for analysis			Zinc
a	Site median concentration	(mg/l)	TCR	0.329
b	Solube fraction		FSOL	0.4
l	(Copper: 40%; Lead: 10%; Zinc: 40%)			
С	Acute Criteria Value	(mg/l)	CTA	0.45
d	Threshold effects level	(mg/l)	CTT	0.945
-	,			
Compute	the once in 3 year stream pollutant concentration			
	=CU*TCR*FSOL	(mg/l)	СО	0.0008
Compare	with target concentration, CTA			
Compare	=CO/CTA		CRAT	0.002
<u></u>	-co/crx		CIAI	0.002
Evalute re:	sults			
а	If CRAT is less than about 0.75			STOP
	A toxicity problem attributable to this pollutant is unlikely			
b	If CRAT is greater than 5 reduction will definitely be required			·
	Estimate the level of reduction possible and repeat the analysis with			
	revised value for either concentration or flow or both			
С	c If CRAT is still greater than 1 and greater reduction levles are not practical			

CRTE

0.00

Estimate the potential for an adverse impact (as opposed to a criteria

violation) by a comparison with the threshold effects level

=CO/CTT